THE
VETERINARY JOURNAL

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JULY, 1926.

MR. J. R. JACKSON, M.R.C.V.S.

THE vacancy caused by the unexpected and lamented death of Sir Stewart Stockman has been filled by the appointment of Mr. J. R. Jackson, M.R.C.V.S., who has, until recently, worthily filled the position of the late Sir Stewart's second in command.

Graduating from the London College in 1897, Mr. Jackson joined the staff of the Ministry almost at once, and for some years was located in the Board of Agriculture laboratories which were temporarily established at Alperton, working especially (in addition to other bacterial diseases), at contagious abortion and certain poultry epidemic ailments. When the Government Committee on contagious abortion was appointed, Mr. Jackson was selected to act as secretary.

In 1905 he was transferred to the headquarters at Whitehall Place, where his organising administrative abilities were speedily put to the test, and it is no fulsome flattery to say that a great deal of the present growth of professional staff of the Ministry, and its wonderful efficiency, is due to the well-thought-out organising ability and co-operation of its present Chief.

His position is no *sinecure*, as he is entering upon his duties with Foot and Mouth outbreaks still cropping up spasmodically, but the Agricultural community can rest contented that the helm is in firm and steady hands ; and Mr. Jackson can, on his side, feel happy in the assurance that he will have the loyal support, not only of his own colleagues, but of his fellow members in the Veterinary profession.

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Editorials

THE ANOMALY OF PSEUDO-VETERINARY PRACTICE AND HUMANE ANIMAL SOCIETIES.

It is a curious coincidence that during the very same month in which the subject of "The Treatment of Poor People's Sick Animals" was occupying the attention of the Central Veterinary Society (as shown by the Report in a recent issue* of our contemporary, the *Veterinary Record*), a similar wave of thought should be passing through the minds of our colleagues in America, as evidenced by a long and strongly-worded editorial in the *North American Veterinarian* for June. The description which is given there of the way the farm animals are advised to be operated upon by some of these amateurs, is too crude and cruel to be believed, were it not that it is vouched for as actually appearing in print in the *Breeders' Gazette*, for April 29th, 1926. It refers to an article by County Agent M. V. Coger, of Lee County Virginia, on the "Bloodless Docking of Lambs," and it describes, in the words of the Editor of the *North American Veterinarian*, "a method of amputating the tails of lambs, that would shame the hardest-hearted vivisector." Mr. Coger, after stating that the operation done in this way had proved satisfactory to him, recommends sawing off the tails "with an ordinary blacksmith's hack saw, and then pinching the large artery under the tail-bone." He advises that it shall be done "with six to eight strokes of the saw," and states that "light strokes are better than heavy ones." We have something to be thankful for in the belief that such actual brutality could scarcely be possible in Great Britain, and had it not appeared in print, we could not have conceived it to be possible in America. Still, a good deal of unintentional cruelty is apt to be done under the guise of humanity by those who really mean to act for the benefit of the animals themselves. There are a number of excellent Humane Societies in Great Britain which have been founded in order to help the cause of the sick animal whose owner is not able to pay the usual fee for skilled veterinary treatment; but that animal has just as much right when sick to be treated properly, and by a properly trained and skilled veterinary physician or surgeon, as its more fortunate brother who is owned by a richer person. Free Clinics for animals are now to be found in many of our large cities. They are very much needed, and justify the idea of their existence in every way; *but the medical and surgical treatment ought always to be administered by veterinary surgeons.* In London the Royal Society for the Prevention of Cruelty to Animals, Our Dumb Friends' League, the Dogs' Home at Battersea, the Brown

* *The Veterinary Record*, June 19th, 1926.

Institute, and our own Veterinary College in Camden Town, have each acknowledged this, and their respective work is under the supervision of properly qualified men. Liverpool has a scheme which is published in full in the *Veterinary Record* for June 19th, whereby the R.S.P.C.A. has collaborated with the Veterinary practitioners of that city, and together they have done most excellent and effective work. Another Society, however, known as "The People's Dispensary for Sick Animals," with numerous branches in London and Provincial towns, which claims to have "treated" approximately 250,000 animals in one year, and to have no less than 23 "well-equipped dispensaries," with a number of travelling caravans, has only the name of one veterinary surgeon on its published staff, and the major portion of the work is carried out by men or women who have no veterinary qualification whatever.

For the sake of the animals themselves, on grounds of humanity, apart from the fact too, that the money subscribed by the general public in response to widespread (and often harrowing) appeals, is really a Public Trust, unskilled men and women (however well-intentioned) have no right to systematically inflict pseudo-treatments by guess-work on living creatures who are powerless to protest.

The diagnosis of disease cannot possibly be accurately made by untrained and unscientific men, and it stands to reason that those who have devoted at least five probationary years of their lives to the study of animal ailments must be in a better position to give relief, than those whose ideas have no scientific foundation whatever. There will always be people who try to take advantage of an opportunity to get something for nothing, and owners of animals are no exception to this rule. The cause in which these animal societies work is a most worthy one; one, too, which the members of the veterinary profession have always staunchly upheld. Let them carry out their part; let them establish and give their moral and pecuniary support to free hospitals and animal dispensaries, *but the veterinary treatment must be carried out by veterinary surgeons.* Any ideas to the contrary are absurd and beyond argument. It is not as if the profession had refused to act, nor is it fair to expect a professional man to give his services to these Societies without remuneration. Ask him to reduce his usual fees and do some work for nothing, as the cause is that of humanity, but "the labourer is worthy of his hire" and it is just as necessary that this should be recognised for the time of the professional man as for that of the well-paid official and his staff who do the organising and secretarial work.

The profession must waken up to these facts or their apathy will result in serious consequences to themselves; consequences which will be

difficult to readjust, for it is not quite " playing the game " to " treat " all and sundry, ostensibly free, but in reality with one eye on the collecting box at the gate of exit. Any plea for " the poor animal " will always " catch on " with the warm-hearted (but often unthinking) British public, and funds can always be obtained for this object—but their administration should be just as much under legal protection as that of our hospitals for human patients, who have the inestimable advantage of being able to complain if the treatment given aggravates, rather than alleviates, the ailment.

For surgery, too, the safe use of anæsthetics can only be carried out under skilled supervision, and for the layman even to obtain these in Great Britain is in most instances so hedged with difficulties as to be quite impossible.

Another very powerful argument for the collaboration of the humane organiser and the humane veterinary graduate.

SCOTLAND AND PUBLIC HEALTH.

SCOTLAND again leads the way in Veterinary Public Health. A short time ago, owing largely to the combined efforts of certain broad-minded medical men and veterinarians, amongst whom Dr. Gerald Leighton and Prof. Gofton took a prominent place, the inspection of meat for the whole of Scotland was placed in the hands of the veterinary profession. This was a step in a common-sense direction, and it is quite time that we in England followed the lead. Scotland has, however, again got ahead of us in public health work by the official appointments of veterinary inspectors for counties and districts. These appointments are whole time, and the remunerations at which they commence, together with the privileges which accompany the position, make the posts worth having. The situation is at present only just commencing, and may be said to be on its trial. It rests with those who have obtained those positions to prove their professional worth and the value of their special knowledge, as applied to the good of the community. Up to the present all the men chosen have been men of experience, and men who have spent a number of years in this class of work. For the young graduate who desires to be entertained as a candidate for any public health appointment, it is wise that he should equip himself, in addition to his diploma, with some such extra qualification as the B.Sc., or the D.V.S.M. Public appointments, although not so lucrative perhaps on the average as private practice, have many advantages which appeal to men of certain temperament. In particular, there are certain regulated times for holiday, certain hours of routine work, after which, come hours of leisure, and the position is an official one which carries with it a certain status and authority.

STUDENTS AND THE SOCIAL LIFE OF OUR PROFESSION.

It is noticed from the Calendar of the Ontario Veterinary College that *Journalism and Public Speaking* are included in course of training for qualification as a Veterinary Surgeon. The Calendar states, " The ultimate aim of the courses is to equip graduates that they may more adequately take their proper places of influence in the communities in which they may be situated."

In these days of agitation for increased recognition of the higher status of the profession, this idea savours of a practical way for attaining that end. For it is only by efficiently equipping the individual Veterinary Surgeon to take his rightful place in the world of scientific learning that the claims of the profession as a whole can be recognised. The profession, as a whole, is foolish in its *awkward and unnecessary* " modesty."

General Articles

ULTRA VIOLET RADIATION.

By V. G. WALSH, M.B., B.Ch., B.Sc.
(*from the Pharmacological Department, St. Mary's Hospital Medical School*)
AND
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Kensington.

These observations were carried out in order to investigate the therapeutic effects of ultra violet radiation in disease and, if possible, to establish the cause of the beneficial results obtained in some conditions.

The clinical experience was done on " so called " dumb animals in order to eliminate any question of suggestion and imagination, or voluntary statements from the patients—to the effect that " they felt much better in themselves," etc. etc. Any results obtained were considered as positive or negative from direct observation of the subject.

The cases selected for treatment were dogs and cats suffering from diseases which had resisted ordinary therapeutic measures—and were classified as follows :—

1.—Skin Affections
- (*a*) Indolent Ulcer.
- (*b*) Eczema.
- (*c*) Follicular Mange.
- (*d*) Alopecia.

2.—Pyorrhœa and Ulceration of gums and lips.

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3.—Nervous Disorders.

(*a*) Pachymeningitis.

(*b*) Cerebellar Ataxia.

(*c*) Loss of Co-ordination after Distemper.

4.—Chorea.

5.—Rickets.

Method.—The loaded carbon arc was used in all of these experiments, exposures varying from three to ten minutes at any one time. In spinal cases, the patient was shaved over the spinal region before exposure. In all cases, general or local, hair was removed so far as possible. In the case of cats undergoing general treatment, an assistant combs the hair back continuously in order to facilitate penetration. The patient's eyes are protected by specially-made small goggles, or by covering the head with a piece of cloth. The former are necessary in treating affections of the head and face.

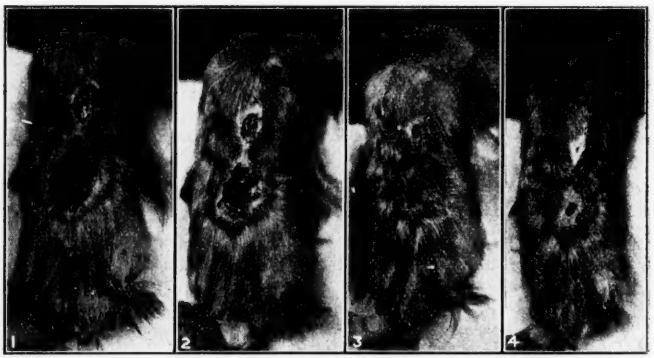

Fig. 1. Original size of ulcer. Fig. 2. After 7 days. Fig. 3. After 14 days. Fig. 4. After 30 days.

(*a*) Indolent Ulcer.

1.—Skin Affections.

Subject.—Spaniel.

Condition.—Ulcer, involving a large area of skin over the metacarpus (see Fig. 1), which had resisted various forms of treatment, including operative, over a period of nine months.

Treatment.—Daily exposure of six minutes, 20 exposures in all, to the calcium loaded carbon arc.

Result.—Complete recovery (Fig. 4) was taken just before complete resolution.

(*b*) Moist Suppurative Eczema.

Subject.—Bulldog.

Condition.—Large patch of purulent periodic eczema on back of neck. Present attack of two months' standing.

Treatment.—Exposure for six minutes daily.

Result.—After second exposure, complete cure. This case is representative of a number which were treated with similar results. Our experience with the U.V. ray is—that complete resolution may be expected, in from two to five days, in this condition. After the second dose the patients show little desire to scratch. The first exposure sometimes results in increased sensitization, but the sedative effect of the U.V.R. soon follows.

ECZEMA IN CAT.

Subject.—Blue Persian.

Condition.—Dry scabs and eczematous patches which had resisted usual treatment for past year.

Treatment.—Five minutes exposure daily for five days. Penetration was effected by combing back the coat over the affected areas.

Result.—Complete recovery.

SEBORRHŒIC ECZEMA.

Subject.—Abyssinian Cat.

Condition.—Typical moist sweaty skin inside thighs and back of hind legs.

Treatment.—Two exposures of five minutes each.

Result.—Complete recovery. In this case treatment was facilitated by absence of hair on the affected parts.

(*c*) FOLLICULAR MANGE.

Subject.—Clumber Spaniel. Demodax parasites demonstrated microscopically.

Condition.—An extremely bad example of the pustular form invading the face, abdomen and all four legs. In parts the skin was perforated and it was possible to squeeze a sero sanguineous fluid through these small holes. The usual strong odour prevailed.

Treatment.—Daily exposures of five minutes. After twelve exposures there was a marked improvement in the appearance of these lesions. There were practically no scales, very little fluid could be squeezed from old pustules—and some patches actually dried up. However, the skin remained erythematous and bare—and the odour persisted. The disease appeared to change from the pustular to the squamous form, but no further improvement took place.

Result.—Failure, except for the secondary good effect upon skin.

(*d*) ALOPECIA.

True alopecia was apparently unaffected, but in treating skin diseases and in treating patches where it had been necessary to shave the hair, it was noted that the hair grew very quickly over the denuded areas, under treatment.

2.—PYORRHŒA AND ULCERATIVE STOMATITIS.

(*a*) *Subject.*—Airedale.

Condition.—Advanced case of pyorrhœa and badly ulcerated gums of 18 months' standing.

Treatment.—Daily exposure of five minutes for three weeks.

Result.—Complete recovery.

(*b*) *Subject.*—Skye Terrier.

Condition.—Extremely advanced case of pyorrhœa of three years' standing. Large septic ulcers accompanied by an odour appreciable at a distance of two feet from the dog.

Treatment.—Daily exposure of ten minutes for ten days. At this stage, there was marked improvement. Treatment was discontinued for two weeks and then resumed three times weekly.

Result.—Great improvement. Although craters of old ulcers existed, they were healthy in appearance and the smell (previously intolerable) had been abolished.

3.—NERVOUS DISORDERS.

(*a*) PACHYMENINGITIS.

Subject.—Pekingese.

Condition.—Characteristic of a spinal neurosis most commonly seen in Pekingese and Dachshunds.

In this case the primary symptoms of pain on movement, tensed abdominal muscles, stilted gait and general hypersensitiveness, had given way to the paraplegic stage. The dog was paralysed and crawled about like a seal.

Treatment.—Daily exposure of five minutes for three weeks.

Result.—Improvement in general health and tone of reflexes. Otherwise no marked result.

(*b*) CEREBELLAR ATAXIA.

Subject.—Sealyham Terrier.

Condition.—The dog was unable to take food voluntarily and unable to stand. Head retracted.

Treatment.—Daily exposure of five minutes. After second exposure liquid food was taken voluntarily and the dog attempted to stand when food was presented. Improvement continued over a period of two weeks when the patient was able to feed and to walk, although

with a typical ataxic gait. He remained in this condition and no further improvement was noted.

Result.—Failure.

(*c*) Loss of Co-ordination.

Subject.—Pekingese.

Condition.—No control over hind quarters.

Treatment.—Eight exposures of five minutes each. After two exposures the dog's spirits rose, appetite returned, and a steady improvement was maintained.

Result.—Complete recovery.

4.—Chorea.

Subject.—Setter.

Condition.—Acute nervousness, marasmus, and generalised chorea. The chorea was particularly marked in the temporal muscles, neck and off shoulder.

Treatment.—Daily exposures of six minutes. After the fourth exposure the dog had greatly improved—he was less nervous and began to put on weight. The chorea became much less violent, but, after prolonged treatment, it still persisted and no further improvement has taken place.

Result.—Failure. The treatment has, undoubtedly, a beneficial effect on the general condition, but no specific effect on the chorea.

Fig. 5. A severe case of Rickets in an Irish Wolfhound puppy.

5.—Rickets.

Subject.—Pekingese.

Condition.—Advanced rickets with considerable distortion.

Treatment.—Daily exposure of ten minutes for ten days.

Result.—Complete recovery.

Treatment of advanced cases, with great deformity (Fig. 5), in the heavy breeds resulted in failure.

In the case of the Pekingese, quoted above, no deformity now exists.

Various theories have been advanced to account for the beneficial action of the ultra violet rays, such as—that bacteria are directly killed, and that the bactericidal power of the blood is increased, etc.

To take the increased bactericidal power of the blood :—We have no knowledge that the bactericidal power of circulating blood is increased, or even affected, nor do we know what bactericidal power is possessed by blood *in vivo*. Even if the killing power of the blood was increased, the results obtained could not be attributed to any such cause. Again, the power of the rays to kill bacteria and its connection with the cure of rickets is difficult to see.

The following experiments, on the killing power of the Rays on bacteria, were carried out with the iron carbon arc and the mercury vapour lamps, at various distances and for varying periods.

EXPERIMENT I.—A smear from a culture of B. coli was made on agar in a Petri dish and exposed directly to the iron carbon arc and to the mercury vapour lamp, and then incubated for twenty-four hours at 37° Centigrade.

Exposed at 12 inches to—

Carbon Arc for	5 minutes	..	..	Result :	Profuse growth	
Mercury Vapour	5	,,	..	..	,,	,, ,,
Carbon Arc	10	,,	..	..	,,	,, ,,
Mercury Vapour	10	,,	..	..	,,	,, ,,

Staphylococcus was now smeared on agar in the same manner and exposed to the carbon arc.

Exposed at	18 inches	for	5 minutes	..	Result :	Profuse growth
,,	18	,,	10	,,	..	,, ,, ,,
,,	18	,,	15	,,	..	,, ,, ,,
,,	18	,,	20	,,	..	,, ,, ,,

Four Agar Petri dishes were now left exposed, on the bench, for four hours, to air infection. Two dishes were exposed to the light for ten minutes, at a distance of 12 inches, and the other two were used as controls. The four dishes were now incubated at 37° for 24 hours. Result : Growth in all four.

EXPERIMENT II.—A dilution of a broth culture of staphylococcus was now made and 200 C.m.m. of the same dilution spread on each of two petri dishes of agar.

One dish was radiated at 18 inches for 10 minutes, and the other served as a control The two dishes were then incubated and, after 24 hours, the number of colonies, which had grown in each, were counted.

Number of colonies growing in control	..	..	120
,, ,, ,,	radiated dish	..	6

The above experiment was repeated, with a different dilution, and the colonies again counted.

Number of colonies growing in control	160
,, ,, ,, radiated dish ..	10

With a third dilution, the count was—

Number of colonies growing in control	130
,, ,, ,, radiated dish ..	0

The interpretation of such results could only be that, when a smear of a culture was made, some bacteria were superimposed on others and protected those, underlying them, from the rays. This would mean that the rays do not penetrate beyond the bodies of bacteria, for when the bacteria were exposed singly to the rays they were destroyed.

Again, from these experiments, it would seem that nuclei absorb the rays, as bacteria are mainly nuclei. We know that the rays penetrate the tissues to a much greater depth than the thickness of a bacterium—in fact they will pass through the lobe of an ear, which has been denuded of blood.

The theory that the bactericidal effect of the rays could account for the results obtained is untenable. In the case of the ulcer (Fig. 1), new tissue formation and healing was very rapid and at no time was the ulcer sterile.

The results of the experiments point to the process being one of increased *oxidation.* As is well known, the oxidation in drying oils is greatly accelerated by the ultra violet rays—and the suggestion of Prof. Collingwood, that probably ozone was the active oxidising substance, led to the following experiments :—

(*a*) Diluted blood, to which a few drops of tincture of guaiacum had been added, was dropped on a piece of filter paper and exposed to the rays. In a few minutes the blue colour appeared.

(*b*) Diluted blood, with guaiacum added, was now placed in a quartz flask and tightly sealed. The flask was exposed to the rays at a distance of three feet and, in a few minutes, the blue colour appeared in the solution. The rays must, then, have formed ozone in the solution. It could not have been due to the presence of any ozone in the air, as the flask was completely sealed.

As all the beneficial results obtained can be accounted for on the theory of increased oxidation, we suggest that the rays penetrate the tissues and form ozone therein, thus accelerating tissue oxidation. Further investigations, in this field, are being carried out, the results of which will be published in a subsequent paper.

CONCLUSIONS.

Chronic ulcers and certain skin diseases are largely benefited by ultra violet radiation. Also, some metabolic disorders are greatly improved.

It would appear that the improvement, in these conditions, is brought about by the formation of ozone in the tissues with resulting increased oxidation.

STUDIES IN RINDERPEST IMMUNITY: (2) METHODS OF INFECTION.*

By H. E. HORNBY, F.R.C.V.S.,
Mpwapwa, Tanganyika Territory.

IT has been said that the study of Infection is the study of the foundation of Immunity. This is true for rinderpest of bovines; for no species nor race of cattle is naturally immune to the disease, nor do I think that inherited immunity occurs. I have not yet found any bovine immune to rinderpest which had not had the chance of acquiring that immunity during its lifetime. Illustrative of this: A mob of 95 cows and 70 calves were brought to this laboratory for double inoculation against rinderpest. They came from a district where the disease had been prevalent during the last four years. After their arrival here the calves were weaned to deprive them of any protection they might be obtaining from the ingestion of the milk of immune mothers, and each beast of the mob was then inoculated subcutaneously with a dose of virulent blood. Of the adult animals only eight (eight per cent.) proved to be susceptible, but 63 (90 per cent.) of the calves reacted, and it is more than probable that the seven calves which did not react had contracted the disease before leaving their village homes.

If it be true that in infections the body is never involved as a whole, and that there is selective affinity of micro-organisms for certain tissues only, then the tissues for which rinderpest virus has affinity must be widespread throughout the body. The virus is ultravisible, yet it is held back from laked blood by close-grained filters to a much greater degree than could be explained by adsorption; so almost certainly it is carried by leucocytes. When we consider how closely related histogenetically are the monocytes of the circulating blood, the endothelial cells of blood vessels, the cells of serous exudates and the clasmatocytes of connective tissue, we can understand that if the virus had selective affinity for this type of cell alone it could still be found in abundance in every part of the body.

* The first article of this series, by H. E. Hornby and G. N. Hall, appeared in the November (1925) number of the VETERINARY JOURNAL. Since then Capt. Hall has left Tanganyika Territory to take up the post of Veterinary Pathologist, Uganda.

When recovery occurs the virus disappears from the body; persisting at most only a few weeks after remission of fever. Rinderpest is an exogenous, general infection set up by an obligatory parasite. This article deals with the sources of infection and the usual avenues of infection. The experiments on the sources of infection revealed nothing contrary to what is stated in all reliable text-books of bovine pathology, and so they will not be stressed, but the experiments to determine the usual avenues of infection yielded results at variance with the belief that infection usually takes place through the alimentary tract, and so these will be dealt with at some length.

As the name implies, rinderpest is a plague of cattle; and only bovines are seriously affected. This article deals only with the disease of *bovidæ*, and is not concerned with the mild infection which may be determined by rinderpest virus in mammals of other families.

Sources of Infection.

At the height of infection the virus is recoverable from every part of the body, so that if a beast die or be killed at such a time every portion of the fresh carcase is infective material. While the infected beast is yet alive, virus passes from it into the outer world in the various secretions and excretions, of which the most important appear to be nasal discharge, urine and dung.

Nasal Discharge is infective very early in the course of the disease; as early as, or before, the second day of the febrile reaction, and within five days of the contraction of infection. Even at this early stage there is generally obvious muco-purulent rhinitis with its migration of leucocytes; and these probably carry the virus. Infectivity of this discharge soon subsides, and I did not find it infective when tested two and three days after complete remission of fever.

Urine was not found to be infective before the third day of fever. Tested three, four and five days after subsidence of all fever it was found to be once more non-infective in small amounts. Even when infective, the urine may not be altered in appearance, and may show no abnormality when submitted to simple chemical tests. Although infective urine may yield very little sediment when centrifuged, yet there is evidence that in urine, as in blood, the virus is attached to cells; because when I passed the urine of Ox 1467, on the sixth day of a good reaction, through a Doulton filter, the filtrate was non-infective in doses of 10 cc., although the control which received the same amount of unfiltered urine subcutaneously reacted on the sixth day thereafter. As rinderpest virus appears to have little specific action on the kidneys, but frequently causes acute cystitis, it is probable that most of the infected cells of the urine are derived

from the blood vessels of the congested mucous membrane of the bladder itself.

DUNG was found to be infective on the sixth day of the febrile reaction, even though there was no diarrhœa. In mild cases, on the 13th and 14th days after infection, and three or four days after subsidence of fever, dung was not infective in small quantities. After a severe attack of gastro-enteritis it is stated on good authority that the dung remains infective for several days longer.

I do not think that any case of rinderpest is so mild that all secretions and excretions may entirely escape contamination by virus, but it is certain that in a mild case the contamination is often not sufficiently great for transmission of the disease to occur readily through their medium. Rinderpest is not very infectious, and when the disease runs a mild course even direct contact during several days may not suffice for transmission. For example, a susceptible ox (No. 1774) was put in the same loose-box as, to share food and water with, Ox 1769, throughout the whole time that the latter was passing through a mild attack of rinderpest, yet he escaped infection.

The virus of rinderpest soon dies when detached from the animal body, and even within the body of a susceptible animal its period of prodigious activity and multiplication is comparatively short, so that the affected beast rarely remains infective for more than 30 days. Sources of infection, then, are confined to the bodies and fresh excretions of animals actually suffering from rinderpest.

AVENUES OF INFECTION.

VIA THE SKIN. There are no reasons for thinking that the intact skin can be passed by the virus. A pad of cotton-wool soaked in virulent blood was bound in position between the claws of susceptible ox No. 1754 without producing infection. Another susceptible ox, No. 1757, during the rainy season, when his feet were moist and soft, had his heels and coronets well rubbed with V.B., yet he, also, failed to react.

On the other hand, broken skin readily admits virus, and *intradermal* inoculation is an easy way of infecting animals. Oxen 1732 and 1728 both received inoculations of V.B. *into* the skin of the shoulder, where they could not lick, and they reacted respectively on the fourth and fifth days thereafter.

SUBCUTANEOUS inoculation is among the sure ways of setting up infection ; even 0·002 cc. of virulent blood being frequently sufficient to set up infection by this route.

INTRAVENOUS inoculation is as effective as subcutaneous. Using V.B. of a virus control on the third day of reaction, I inoculated two

oxen subcutaneously and two intravenously with the same dilutions and got the same results :—

Ox 1464 received 0·0002 cc. V.B. subcutaneously, but did not react.
„ 1463 „ 0.002 „ „ „ and reacted.
„ 1466 „ 0·0002 „ „ intravenously, but did not react.
„ 1465 „ 0·002 „ „ „ and reacted,

i.e., the minimal infective dose is the same by either the subcutaneous or the intravenous route.

Transmission by Biting Flies. As the tissue lying below the protective epidermis is so intensely susceptible to infection, as is seen by the small amounts of V.B. which suffice to infect subcutaneously, intradermally or intravenously, it is probable that the virus is often mechanically transmitted by biting flies.

I allowed three captive tse-tse flies (Glossina morsitans), confined in one wide-mouthed bottle, to commence to feed on Ox 1706 at the height of reaction, and then to finish their feed on susceptible ox No. 1709. As nothing happened, I repeated the experiment a week later ; this time using two flies, confined each in its own bottle and fed separately, first on ox No. 1708 at the height of reaction, and then on ox 1709. This time I succeeded ; and the susceptible ox commenced to react four days later, and subsequently died from acute rinderpest.

Intraperitoneally. Although I do not know whether the peritoneum is as susceptible to infection as is the subcutaneous tissue, yet as I have set up the disease by the intraperitoneal injection of 0·2 cc. of V.B. it is obvious that the peritoneum is easily infected. The injection was made through a long canula, which was washed out with saline before withdrawal, so that any subcutaneous contamination would be below the minimal infective dose.

By the Mouth. It is difficult to set up rinderpest by drenching through the mouth.

On June 19th, 1924, eleven yearling bulls were drenched, each with 100 cc. V.B. None reacted, so on July 7th they were again drenched, this time each with 400 cc. V.B. In four cases mild rinderpest reactions followed. The susceptibility of the remaining seven was afterwards tested, and six were found to be susceptible. That is, of ten susceptible calves drenched through the mouth each with 100 c.c. of V.B., none reacted, but when the same ten were afterwards drenched with 400 cc., four reacted.

July 15th, 1925. A susceptible ox, No. 1606, did not react when drenched through the mouth with 200 cc. V.B.

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July 30th, 1925. A susceptible ox, No. 1608, did not react when drenched through the mouth with 100 cc. V.B. mixed with 100 cc. of bile from the same animal.

August 6th, 1925. A susceptible ox, No. 1641, was drenched through the mouth with 900 cc. V.B., and the gums were rubbed at the same time. No reaction resulted.

March 22nd, 1926. I dipped the face of a beast dying from rinderpest, and whose mouth was a mass of sores, into a bucket of water, and to this fluid I added some sanguineous dung of the same beast. I then poured this grossly contaminated water over the food and into the drinking trough of susceptible ox, No. 1757. He certainly ate the food, and probably drank some of the water, yet he was not affected thereby.

When one remembers that the superficial lining membrane of the mouth, œsophagus, first three stomachs, and much of the pharynx is a stratified epithelium closely resembling the epidermis, and when one remembers, further, that the virus is easily destroyed at body temperature, it is not surprising that infection is not easily set up by the mouth. It remains to be seen whether, if the virus survives the journey as far as the abomasum and small intestine, it can then penetrate the bowel wall and set up infection. I endeavoured to determine this by comparing the results of giving V.B. through a canula into the rumen and into the abomasum. The operative procedure was to cast a susceptible ox and pass a long thin trocar and canula through the skin into the stomach. That the instrument was correctly inserted was shown by the escape of ingesta when the trocar was withdrawn. By means of a syringe and well-fitting rubber connection the injection of V.B. was made. Then saline was pumped through, and while the last saline was passing the canula was withdrawn. The amount injected into the rumen was five times that injected into the abomasum.

The following oxen were injected *intra-abomasumally* with 18 cc. of V.B. plus 2 cc. of 7½ per cent. citrate solution :—

Ox 1734 reacted on the 4th day.
,, 1737 ,, ,, 6th ,,
,, 1746 ,, ,, 5th ,,

The following oxen were injected *intra-rumenally* with 90 cc. of V.B. plus 10 cc. of 7½ per cent. citrate solution :—

Ox 1733 did not react, though susceptible.
,, 1738 ,, ,, ,, ,,
,, 1740 reacted on the 4th day.

That is, only one of three reacted to intra-rumenal injection of 90 cc. of V.B., but three of these reacted to the intra-abomasumal injection of only 18 cc. of blood. Nevertheless, as the position of the abomasum makes leakage through the punctured wound more likely to occur than is the case after intra-rumenal injection, these experiments do no more than support the hypothesis that virus which gets past the protection of the first three stomachs is absorbed through the mucous membrane of the abomasum or small intestine.

In the cases when infection results from drenching by the mouth, it may be that the virus penetrates the wall of the alimentary tract below the omasum, as suggested above, or penetration may be through that part of the pharynx wall which is not covered by stratified, squamous epithelium, because, as we shall see in a moment, the respiratory tract is extraordinarily sensitive to infection.

INTRA-RECTAL injection of 200 cc. of V.B. failed to set up infection on the two occasions tried, and swabbing the rectal walls with a pledget of cotton-wool soaked in V.B. was also without effect. As the function of the rectum is probably entirely excretory, one would not expect its walls to be easily passed by organisms. Here, however, the mechanism of protection is not furnished by stratified epithelium, but by the mucus which is poured out in such abundance.

INFECTION VIA THE RESPIRATORY TRACT. It is easy to set up rinderpest by drenching *through the nostrils*. This was first pointed out to me by Mr. F. J. McCall, the C.V.O. of this Territory.

August 27th, 1925. Ox No. 1655 was drenched through the nostrils with 200 cc. V.B. He reacted the third day, and subsequently died of acute rinderpest.

September 3rd, 1925. Ox No. 1661, drenched through the nostrils with 50 cc. V.B., reacted the third day thereafter.

December 17th, 1925. Ox No. 1722 was drenched through the nostrils with a bottleful of infected dung, and he reacted four days later.

That infection in the above-mentioned cases is really via the respiratory tract is indicated by the ease with which infection can be set up by *intra-tracheal* injection.

August 27th, 1925. Ox 1654, injected intra-tracheally with 20 cc. citrated virulent blood, reacted the third day.

September 3rd, 1925. Ox 1660, injected intra-tracheally with 1 cc. V.B., reacted the fourth day.

October 8th, 1925. Ox 1683, injected intra-tracheally with 0.2 cc. V.B., reacted the fourth day.

January 6th, 1926. Ox 1729, injected intra-tracheally with 0.2 cc. V.B., reacted the sixth day.

In the last two experiments the virulent blood was much diluted and was given through a canula which was washed out with saline before withdrawal. If, however, further proof were needed to show that the respiratory tract is particularly sensitive to infection, it is furnished by the experiments which show how easy it is to set up infection by merely swabbing the nasal mucous membrane with a pledget of cotton-wool soaked in infective material.

October 14th, 1925. The nasal M.M. of Ox 1686 was swabbed with infected nasal discharge, and he reacted on the fifth day.

October 29th, 1925. The nasal M.M. of Ox 1692 was swabbed with infected nasal discharge, and he reacted on the seventh day.

October 29th, 1925. The nasal M.M. of Ox 1693 was swabbed with V.B., and he reacted on the ninth day.

November 5th, 1925. The nasal M.M. of Ox 1698 was swabbed with V.B., and he reacted on the eighth day.

November 5th, 1925. The nasal M.M. of Ox 1699 was rubbed with infected nasal discharge, and he reacted on the eighth day.

November 19th, 1925. The nasal M.M. of Ox 1707 was rubbed with infected urine, and he reacted on the fifth day.

It is obvious, then, that rinderpest virus can easily pass the mucous membrane of the respiratory region of the nasal chambers. It must be remembered, though, that the ciliated epithelium which covers this mucous membrane is replaced in the vestibule of the nose by stratified squamous epithelium, which, like epidermis and the epithelium of the mucous membrane of the anterior parts of the alimentary tract, is resistant to the passage of virus. Hence, it is incorrect to say that infection is easily set up by swabbing the *nostrils* with infective material. I rubbed the nostrils of Ox 1728 with V.B., and he did not react, though susceptible.

As an example of how *natural infection* may be brought about via the nasal mucous membrane one may give the case of a bull or ox who pushes his nose into urine which is being passed by an infected beast.

I collected urine from a reactor, and poured it over the muzzle, and somewhat up the nostrils, of Ox 1743. He commenced to react from the fifth day thereafter.

Via the Conjunctiva. The epithelium of the conjunctiva is transitional, and its superficial cells are partly flat, partly polygonal and partly cylindrical in form, and so there is nothing in its structure to indicate whether it is most likely to be protective or receptive.

April 23rd, 1926. The conjunctiva of Ox 1778 was swabbed with infected liver extract, and he reacted on the fourth day.

On the other hand, Ox 1754 failed to react after his conjunctiva

had been swabbed with lachrymal discharge from a beast dying of acute rinderpest. This single experiment is against the transmission of rinderpest by house-flies passing from eye to eye.

CONCLUSIONS.

The thick, stratified, squamous epithelium which covers the skin, and lines the mouth, œsophagus, etc., is ample mechanical protection against the penetration of rinderpest virus from outside; so that infection does not occur across the unbroken skin, and if occasionally by the mouth, then only by penetration of the wall of the pharynx or after the virus has passed the first three stomachs.

The transitional epithelium of the conjunctiva is not an efficient barrier, and the stratified, cylindrical epithelium of the true nasal mucous membrane is passed with ease. It is probable that the virus makes the passage of such epithelia within or attached to wandering leucocytes.

Sources of infection are confined to the bodies and fresh excretions of animals actually suffering from rinderpest.

The possibility of transmission of rinderpest by blood-sucking flies has been demonstrated experimentally, but much observation in the field will be necessary before it can be stated whether at certain seasons such insects are important transmitters.

In nature, the commonest way in which the disease is spread is probably by direct contact of the nasal mucous membrane with infective excretions.

MECHANICAL MILKING.*

By DR. GALLIA.

IN an article which I wrote under the above heading in the *Agricultural Scientific Paper* for Czecho-Slovakia (No. 11 of the 10th April, 1925), I said that I was not at that time in a position to be able to express any definite opinion upon the advantages or disadvantages of milking machines, or, indeed, with regard to the advisability of using mechanical milking at all.

If any opinion is to be expressed about mechanical milking, it is absolutely necessary to make accurate comparative tests between milk which has been drawn by hand, and milk which has been drawn through a machine.

Bacteria and mould funguses have the most active effect on milk. For this reason the care taken in drawing milk and storing it under the most scrupulously clean conditions is of the utmost importance if the milk is required to be kept for any length of time.

* Abstract from *The Scientific Agricultural Paper*, Czecho-Slovakia.

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Up to 100,000 bacteria per cubic centimetre is quite usual in milk which has been drawn by hand.

All the changes which the milk undergoes after it has left the udder are of bacterial origin. Therefore, to show how bacteria can be excluded from milk is of great practical importance to the milk producers and to the retailer. In any case, it is of the greatest importance to have as few germs in the milk as is possible. Germs which enter the milk during the process of milking come from the dry hairs of the udder and are shaken into the milk pail as the hand works on the teat. Hay dust, small particles of foodstuffs, dirty milk vessels and especially the dirty hands of milkers, constitute the principal sources from whence contamination arises. Very careful methods have to be adopted if milk with a low bacteriological content is to be produced.

The actual constituents of milk are affected by the breed of the animals (each with their own peculiarity), the point in the period of lactation when the milk is drawn, the sexual activity, the food, exercise taken, the warmth and general comfort or otherwise of the cowsheds; but most particularly the manner in which the actual milking is accomplished.

As the period of lactation advances, the amount of fat to be found in the milk generally increases. The last milk drawn (known as the strippings) is always richer in fat than the first milk taken. For this latter reason, only that milk which has been regularly milked right out to the last drop is known as " best milk " in the milk trade. It is clear, therefore, that attention must be paid to uninterrupted and complete milking out of the udder and consequently the solution of this problem is to be found in a machine which is absolutely precise and regular in its action.

The quantity of milk drawn is also of the greatest importance. It is only possible to determine which method of milking is the most productive by making an exact comparison of the amount of milk obtained by each method. Such a comparison must be made throughout the whole of a lactation period, or at the least over several months, and then not only of milk obtained from one cow, but from a great number of cows, each in the same period of its lactation, or otherwise an increase or a decrease in milk yield can be attributed to other causes than that of the method employed of milking the cows.

Hand milking is an unnatural proceeding. That is obvious and is impossible to deny. If the sucking of the calf on the teats is held to be the natural way of emptying the udder, then the process of hand milking is quite different and consequently must be unnatural.

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Because the bulk of the milk is secreted by the cow during the actual process of milking and because she possesses the power to stop this secretion if she is unsatisfied or otherwise dislikes the process of milking, therefore the amount of milk obtained depends principally upon the skill of the milker.

The importance of the way in which the milking of a cow is done is proved by the numerous schools of thought which exist as to how, precisely, hand milking should be accomplished, and the courses at different colleges which are held to teach the theory and practice of milking.

Taking into consideration the fact that each hand milker on a farm has of necessity to milk a number of cows, then it will be agreed that it is only the conscientious milkers who will milk out completely every cow. When milking a number of cows, the hand milker is apt to get tired and consequently becomes careless and sloppy in his milking. For this reason the act of milking cannot be as pleasant for the cow as it really would be if she were milked in a natural way. Another result is that the quantity of milk obtained will be less than which is actually possible.

A milking machine can be made which is absolutely uniform in its operation and soothing in its action. The factor of fatigue of the operator cannot affect the cow. Provided that the construction of the apparatus is based upon the act of sucking of the calf, which is the fundamental and natural method of milking a cow, then a milking machine will be preferable to a hand-milker. I would observe that cows which have shown themselves to be restless when hand milked very soon and easily become accustomed to a good milking machine.

As regards the complete milking dry of the animal it must be remembered that the lactic glands are always secreting milk. This milk will collect in the milk cisterns, so that even if the milking has been very completely carried out, nevertheless, in a very short while after milking is over it will be possible to draw off further milk. It is true, therefore, that theoretically a cow can never be milked right out. From experience, however, it can be shown that prolonged stripping of cows is not profitable. When stripping the cows is recommended after the machines have been taken off, it is done in order to ensure that a regular inspection of the teats is carried out.

Nineteen cows in milk were selected and given index numbers in order to carry out experiments for judging between both ways of milking. They were put on a farm at Blanda. Commencing on July 1st, 1925, samples of milk were tested in respect of their quality as well as quantity. The results are shown on the following table. From this Table it will be seen that from July 1st to September 27th

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tests were made from hand drawn milk, and from September 28th to 12th October from machine drawn milk.

During the period of hand milking the following food was given :—

A. Green food as much as the cow would eat.

B. 2 Kgs. mixture of : 1 Kg. bran.
$\frac{1}{3}$ Kg. malt.
$\frac{1}{3}$ Kg. oil cakes.
$\frac{1}{3}$ Kg. barley meal.

During the period of machine milking the food consisted only of beetroot leaves (sugar refineries), and at night barley straw was mixed with them.

COMPARISON BETWEEN HAND AND MACHINE MILKING OF 19 COWS.

(*a*) By Hand Milking.

Daily Record.

Date ...	1/7	2/7	3/7	4/7	5/7	6/7	7/7	8/7	9/7	10/7
Milk in Litres	163·0	163·0	160·5	169·0	159·5	165·5	158·5	158·0	158·5	157·5
Fat Content %										
Maximum Variation in Fat Content % ...										

Date ...	14/7	15/7	16/7	17/7	20/7	27/7	3/8	10/8	17/8	24/8
Milk in Litres	150·0	143·5	146·0	141·5	143·5	140·0	127·5	124·5	122·0	116·5
Fat Content %										
Maximum Variation in Fat Content % ...										

Date ...	31/8	7/9	14/9	21/9	Average.
Milk in Litres	135·5	147·5	156·0	149·5	148·2
Fat Content %					4·19
Maximum Variation in Fat Content % ...					0·27

(*b*) By Machine Milking.

Daily Record.

Date...	28/9	29/9	30/9	1/10	2/10	3/10	4/10	5/10	6/10
Milk in Litres ...	163·0	162·5	159·5	163·5	156·0	155·0	159·0	162·5	157·5
Fat Content % ...									
Maximum Variation in Fat Content %									

Date	7/10	8/10	9/10	10/10	11/10	12/10	Average.
Milk in Litres ...	157·0	152·5	152·5	156·5	156·5	159·0	164·8
Fat Content % ...							4·28
Maximum Variation in Fat Content %							0·14

A comparison of the tables gives the following results :—

1. In the first place the great inconsistency between different cows milked by hand is striking. This influences of course the total quantities per day from the 19 experimental cows. On the other hand you will see from the table of machine drawn milk how very constant is the total quantity of milk taken from the cows. There are no great fluctuations.
2. It can be shown that at the commencement of the hand milking experiments one or more cows showed a certain maximum quantity which later in the experiment fluctuated or dropped. Directly, however, the machine milking was begun the old high level was obtained which is a sign that by machine milking all the milk which the glands produced was drawn.
3. During the period of hand milking the feed for the cows was in every way stronger than it was during the period of machine milking. Nevertheless, you will notice that the total quantity of milk in the later case was greater than in the first case.

From the three observations made above the following conclusions can be drawn :—

1. With milking machines the milk gland is always working uniformly and is always uniformly emptied.
2. The milk gland is absolutely emptied, *i.e.*, secretes all the milk it possibly can.

We arrive at similar conclusions by comparing the fat content in hand-drawn milk and that in machine-drawn milk. In fact, we can go further and show that the far content in hand-drawn milk is subject to greater fluctuations than that of machine-drawn milk. You will notice that the difference between the lowest and the highest quantity of milk from the different experimental cows is greater in the case of hand-drawn milk than it is in the case of machine-drawn milk. The amount of fat in machine-drawn milk is a little greater than it is in hand-drawn milk, although, as I have pointed out above, the food given to the cows during the period of hand milking was inferior to that which was given during the period of machine milking. This astonishing result can be explained by the fact that with machine milking the udder is milked out and the last quantities of milk contain the highest amount of fat.

In order to prove the above and also to establish what influence the method of milking had upon the amount of fat in milk, the following experiment was made with Cow No. 7. This cow was milked out teat by teat in such a manner that the milk from each teat went into a series of separate 100 gramme bottles. The contents of each bottle tested afterwards for fat content. The following are the results obtained :—

	Right Front Teat.	Amount of Fat.
Bottle No. 1	96 g. Milk	3·3%
„ „ 2	84 g. „	3·7%
„ „ 3	90 g. „	4·0%
„ „ 4	80 g. „	4·1%
„ „ 5	98 g. „	4·4%
„ „ 6	45 g. „	5·7%

	Left Front Teat.	Amount of Fat.
Bottle No. 1	90 g. Milk	3·2%
„ „ 2	88 g. „	3·3%
„ „ 3	84 g. „	3·4%
„ „ 4	78 g. „	4·2%
„ „ 5	44 g. „	5·2%

	Right Rear Teat.	Amount of Fat.
Bottle No. 1	87 g. Milk	3·4%
„ „ 2	89 g. „	4·0%
„ „ 3	100 g. „	5·9%
„ „ 4	92 g. „	5·9%
„ „ 5	39 g. „	8·5%

	Left Rear Teat.	Amount of Fat.
Bottle No. 1	86 g. Milk	2·5%
„ „ 2	87 g. „	2·6%
„ „ 3	85 g. „	2·8%
„ „ 4	78 g. „	2·9%
„ „ 5	88 g. „	6·8%
„ „ 6	78 g. „	9·5%

The teats were milked out one after the other and not simultaneously. Adjacent quarters would be affected by this method with the result that a small quantity of milk would collect in the milk cistern of a teat which had already been milked. Therefore, the teats were re-milked at the end of the milking of all quarters, with the result that 74 grammes of milk were obtained out of the four teats, having a fat content of 7·1%. This shows that the milk collected in the milk cistern during the day and the first drawn off is the poorest. The fat content of milk increases during milking, and you can see from the above tables that the fat content rises as the milking proceeds. When putting all the milk together, it is this high fat content at the end of milking which corrects the low fat content at the commencement. If a cow is not milked out carefully, therefore, the mean content of fat in the whole milk quantity will be lower than it need be.

For example, if this last drawn milk had been disregarded, then the average content of fat for the single teats would have been—

3·85%
3·77%
4·03%
3·56%

But by adding the last drawn milk the corresponding average fat content is raised to—

4·03%
3·95%
4·46%
4·49%

and the average fat content for all four teats together would be—

Without last drawn milk 3·83%
With „ „ „ 4·24%

It will be seen from the above that the fat content in milk is very dependent upon the way in which the cow is milked. It is quite easy, therefore, to appreciate the common idea that results of milking vary in direct proportion to the conscientiousness of the hand milker.

Because the fat content in machine drawn milk is higher than the fat content in hand drawn milk, it follows that the udder is better emptied in the former case.

The chief quality required of commercial milk is that it shall keep sweet as long as possible. This is governed by the number of bacteria which enter the milk during the process of milking and subsequently. The bacteria which enter the milk do not commence their destructive action until after a definite period of incubation. The period of incubation in warm milk is from 38 hours and in milk cooled down about 10 degrees, it is between 52 and 75 hours. The precise time is dependent upon the number of bacteria present.

It will be seen, therefore, that clean milk has an incubation period of about one to four times longer than dirty milk. Milk hygienically produced takes double the time to curd than contaminated milk takes.

In order to compare hand milking with machine milking in so far as contamination of the milk was concerned, counts were taken of samples. Samples were taken once weekly of hand drawn milk and twice weekly of machine drawn milk. A further daily sample was taken to watch the results of the cleaning of the machines. Bacteria colonies were counted, bred on Orla-Jensen nutritive substratum, dilution 1-1,000.

The counts of hand drawn milk were :—136·000, 152·000, 193·000, 117·000, 149·000, 187·000, 158·000, 126·000, 134·000, 172·000.

The counts of machine drawn milk were :—11·000, 23·000, 19·000, 28·000, 35·000, 33·000, 41·000.

After the first cleaning which has to be repeated every week, the numbers of bacteria were 21·000, 26·000, 24·000, 31·000, 36·000, 29·000, 34·000.

There is no doubt but that these counts could have been reduced considerably by more careful cleaning of the teats and of the milking machine.

The various kinds of bacteria found in milk have different reactions on the milk. For instance, bacilli, acidi lactiti, bacterium coli, etc., ferment the milk and turn it into lactic acid, which in turn under certain conditions turns the casein into curds.

Further experiments were carried out to discover whether machine milking excluded any particular kind of bacteria or whether milk drawn by a machine contained larger quantities of any particular bacillus than did milk drawn by hand. For convenience of comparison the milk was graded into four classes according to the time taken to bring about decolorisation. When any impurities such as food or particles of dirt were found in the milk, then it was classified one grade lower.

The results of hand drawn milk from 30 samples were :—

Grade I	.. ..	Nil.
,, II	.. ..	3 samples.
,, III	.. ..	18 ,,
,, IV	.. ..	7 ,,
,, V	.. ..	2 ,,

The result of machine drawn milk from 21 samples were—

Grade I	.. ..	19 samples.
,, II	.. ..	2 ,,

These results are very favourable to mechanical milking and are obvious when you consider that machine-drawn milk never comes into contact with the air in the cowsheds. Further, the only impurities which can enter the milk are bacteria on the teats in the udder or on different parts of the machine.

Reviewing the profits and working costs, the following data were supplied to me by the Directors of the Mueglitzer Sugar Refinery.

When hand milking was done the following staff were required at Blanda Farm :—

1 Head Cowman	at Kc. 22	per day	=Kc. 22
6 Hand Milkers	,, Kc. 18	,,	=Kc. 108
2 Assistants	,, Kc. 18	,,	=Kc. 36
Total 9			Kc. 166

Representing a Wage Sheet of Kc. 4,980 per month.

Since the introduction of mechanical milking the following staff only are necessary :—

1 Head Cowman	at Kc. 22	per day	=Kc. 22
1 Second Cowman	,, Kc. 22	,,	=Kc. 22
3 Assistants	,, Kc. 18	,,	=Kc. 54
Total 5			Kc. 98

Representing a Wage Sheet of Kc. 2,940 per month.

To this last figure must be added the cost of power to drive the plant, which for this particular farm was Kc. 650 per month.

Total costs are therefore :—

By Hand Milking ..	Kc. 4,980 per month.
,, Mechanical Milking	Kc. 3,590 ,,
Saving	Kc. 1,390

In addition, the increase both in quantity and quality of milk obtained, when mechanical milking is done, must be taken into consideration, and it will be seen what a good investment the plant really is.

Summarising the results obtained with the milking plant described above in * this journal, the following conclusions are reached.

1. The quantity and quality of the milk produced both show an improvement and at the same time increased profits are obtained due to lowering of labour charges.
2. Milking with this plant is not injurious to the mammary glands, but is actually beneficial: the unnatural action of hand milking is done away with and in its place a natural action is substituted very similar to the sucking of the teats by a calf.

   The milking is always uniform and eliminates the personal elements of inexperience, temper, etc., which occur with hand milking.
3. Finally, from a hygienic point of view, mechanical milking is ideal as contamination of the milk in the shed becomes practically impossible.

I wish to express my very best thanks to Mr. Oskar Kunovsky, Professor in Chemistry of the Staats-Realgymnasium in Hohenstadt, for his extremely valuable support in this work and especially for the carrying out of all the chemical tests mentioned.

NOTES FROM THE DISSECTING ROOM.

By A. W. WHITEHOUSE, M.A., M.R.C.V.S.,
Principal and Professor of Anatomy, The Veterinary College, Glasgow.

Surgical Roads to the Parapharyngeal Lymph Glands and the Guttural Pouch in the Horse.

Together with Captain H. S. Eakins, Veterinary Corps, U.S.A., I reported (about 1911) in what was then the American Veterinary Review, on a comparatively safe and very easy method of reaching these structures, and I have since taught this route to my students in anatomy; but as very little notice seems to have been taken of our work, I take this opportunity of going over the ground again.

Guttural Pouch disease must be very rare: I have seen one clinical case, which I always suspected to have been caused by operation, and in the hundreds of dissections that I have looked at I have only found one diseased pouch, that being an extension downwards from an old poll-evil of the indurative type.

On the contrary, parapharyngeal abscess is pretty common in strangles and the symptoms are often alarming.

* The milking machine described in the above abstract was the Alfa-Laval Milker.—Editor "Veterinary Journal."

It has always seemed to me that Chabert and Viborg went out of their way to find difficult and dangerous roads.

By the methods I am now going to describe, students in Colorado opened and drained a large number of pouches on anæsthetised experimental animals without any difficulty; and what is much more practical, when I had an opportunity during the war to do a little surgery, I opened a number of parapharyngeal abscesses and obtained prompt and satisfactory healing.

The whole operation can be done standing with local anæsthesia, preferably in the stocks, but any recumbent position is as satisfactory. Not only the glands, but the pouch should always be approached from below.

The two omo-hyoids and the two sterno-hyoids join in the upper tracheal region to cover the lower aspect of the larynx and insert on the transverse body of the hyoid bone. Unless there are abscesses on both sides it is best to operate about three-quarters of an inch to the diseased side of mid-line, but a mid-line incision will open an easy road on each side of the larynx, trachea, and pharynx.

Make an incision six or seven inches long through the skin, starting a little in front on the laryngeal prominence, and continue it parallel to the ventral mid-line. Then divide the muscle in its length, that is in the same direction as the fibres, until the hand can be admitted quite easily through the wound. There will be nothing but capillary hæmorrhage. The muscle is normally about half an inch thick, but may be soaked and œdamatous, when the abscess wall is likely to be the next thing found. The rest of the operation is done with the hand, which now enters a very extensive areolar space and which can be pushed quite easily up along the side of the larynx and over the wall of the pharynx where it joins the œsophagus. Here will be found the lymph glands and the external carotid artery, but the artery can be pushed aside without difficulty—there is nothing but areolar tissue to the base of the cranium, and the fossa atlantis.

If the case is one of parapharyngeal abscess the wall may be thin, when it can be punctured with the finger; if thick the bold man will push into it with a sound, and the cautious man will wait for it to point. Knives and scissors are much better left outside the wound.

If it is desired to enter the guttural pouch, a large area of its lateral wall can be found just above the lymph glands, and it can be broken into without much difficulty with the finger. The opening should be enlarged to the desired extent by tearing. All the fingers can be introduced and the pouch well explored, first one hand and then the other being used. There is no difficulty, although there is perhaps some risk, in making a counter opening. Introduce a strong

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sound and pass it upwards and backwards, then turn it outwards and feel for it through the skin near the rim of the wing of the atlas. Incise the skin along the rim and dissect down through some loose tissue. It may be necessary to draw the edge of the parotid gland forward, and the end of the sound will then be apparent, covered by the wall of the pouch and a little of the loose tissue. The risk is that the sound may have picked up the fold that carries the internal carotid artery, the vagus and accessory nerves, but with a little manipulation these will work away. One point must be borne in mind: in many cases the pouch does not extend naturally as far back as it has been pushed by the sound, and if a tape is to be introduced from above, it should be passed into the atlantal operation wound and be brought out below, before the sound is removed.

I have thought that the lower incision described could be done in mid-line in cases of pharyngeal choke, both hands being introduced with the idea of removing the obstruction by massage of the post-pharynx, and the aditus of the œsophagus. Physically, it should be quite easy to do.

REGION OF FORELIMB.

HORSE.—Mr. Bruce Pottie, Class A, raises an interesting question regarding the growth of the hoof, which I am unable to answer.

The wall starts at the coronary villi and grows downward at the rate of about four inches per annum. The horny laminæ start at the sensitive laminæ and these are stationary. Yet the horny laminæ are firmly fused to the inner face of the coronary wall. That they must leave the sensitive laminæ is shown by the laminar appearance of an overgrown hoof below the sole. The relation between horny and sensitive laminæ during life is also intimate and binding. But the downward movement of the coronary wall and so of the horny laminæ is going on at the rate of four inches a year, and this works out at a little over 11 microns an hour, so that somewhere a cell must leave its deeper neighbour and another from above take its place once every hour. How is this provided for without the production of a wound?

OX.—Mr. P. Leckie, Class B, observes:—The deep pectoral muscle has a slip running up three or four inches on the shoulder fascia in front of M. Supraspinatus, representing the anterior deep pectoral of horse and pig.

SHEEP.—In one case Mr. H. G. Stewart, Class B, observes a similar arrangement to that of the ox.

In another case Mr. Neil McArthur, Class B, finds that the slip from the deep pectoral M. (representing anterior deep pectoral) fuses with M. Supraspinatus.

PIG.—Mr. J. M. Ingram, Class B, and Mr. J. M. McDonald, Class B, observe :—The anterior deep pectoral M. has a double insertion in front of the shoulder.

M. Coraco-Brachialis has two parts.

The medial head of M. Triceps Brachii has two parts between which is found the common insertion of M. Teres Major and M. Latissimus Dorsi.

DOG.—Mr. B. Pottie, Class B, observes :—The metacarpal pad receives slips from each of the superficial flexor tendons.

THORACIC WALL.

SHEEP.—Mr. G. Slavin, Class A, and Mr. T. L. May, Class A, observe :—A large artery and vein emerge between third and fourth ribs at lower border of M. Ilio-costalis to enter M. Serratus Ventralis. These are later shown to be perforating branches of the subcostal (or supreme intercostal) artery and vein.

THORAX.

OX.—Mr. R. K. Kent, Class A, observes :—An artery for the right Apical Bronchus arises from the dorsal surface of the Brachio-cephalic trunk about 4½ inches from its origin and runs back on the left surface of the Trachea for about three inches, then turns sharply across the ventral surface of the Trachea to the right Apical Bronchus.

GREAT VEINS.

OX.—The arrangement of the great veins is usually as given in the text books. They are, however, unlike those of the horse, subject to rather frequent variations. In the last five dissected, two have been atypical.

In one last year Mr. P. Leckie, then Class A, observed :—The anterior Vena Cava was double, the common jugular and brachial (or axillary) veins of each side united to make an innominate vein which was continued to the heart. On the right side the vein behaved like a typical anterior Vena Cava, entering the Sinus Venarum of the Right Atrium at the usual place. On the left side the vein picked up the Vena Hemiazygos at the left posterior aspect of the coronary groove and wound round the back of the groove to enter the Right Atrium by the Coronary Sinus, which was correspondingly large.

This spring, Mr. D. W. Menzies, Class A, observes :—The Vena Hemiazygos is absent ; its place is taken by a Vena Azygos, whose course and termination in the Right Atrium is exactly like that of the horse, except that it has a large anastomosis with the subcostal vein. (This anastomosis occurs, but not at all regularly, in the horse.) There is no abnormality in the Anterior Vena Cava.

PIG.—Mr. G. Slavin, Class A, and Mr. T. L. May, Class A, observe :—The œsophageal nerve trunks (terminals of the vagi) are not made up each from dorsal and ventral branches of the right and left vagi, but the dorsal nerve is a continuation of the right vagus and the ventral nerve is a continuation of the left vagus, the two being about equal in size. After they have assumed position they throw interlacing branches forming a true œsophageal plexus.

OBSERVATIONS ON THE UTERO-OVARIAN ARTERY IN NON-PREGNANT FEMALES.

MARE.—Its calibre is larger actually and relatively than in other animals, and the uterine branch is much more considerable. Though tortuous it only travels about 1½ inches from aorta to ovary, and it seems probable that the main vessel would be divided in spaying by the vagina. It is clear that a proper method of control of hæmorrhage is necessary.

COW.—The calibre is extremely small and the uterine branch is negligible ; the artery is very long, leaving the aorta close to the posterior mesenteric artery. This is as one would expect, seeing that there is practically no loss in spaying heifers.

EWE.—The artery is like that of the cow, but perhaps even smaller.

SOW.—The calibre is considerable.

BITCH.—The artery is three to four inches long in a 35-lb. bitch, coming forward from near the break up of the aorta to the ovary just behind the kidney. It is small, the uterine branch is almost negligible and there seems little danger of rupturing the vessel in the tension put on it in spaying.

THE LARYNGEAL ARTERY IN THE HORSE.

The exact course of this vessel is of great interest in relation to the operation of stripping the ventricle. None of the text-books on anatomy carry it farther than its entrance into the larynx, but Bradley, "Head and Neck of the Horse," Fig. 38, p. 99, has a very good illustration.

The course and relations seem pretty constant. The vessel crosses over the crico-thyroid M. and passes between the wing of the thyroid cartilage and the lateral crico-arytenoid M. about half way down the cricoid arch ; it reaches the outer posterior border of the ventricle (or saccule) and turns up this border to its apex ; as it turns it gives off an embracing branch. The vessel is quite large enough to give a lot of trouble if injured ; though in close contact with the outer wall of the ventricle, it is not adherent to it, but its presence certainly calls for a good deal of caution.

The Innervation of the Mandibular (Submaxillary) Salivary Gland.

This is given in the text-books as coming from the Chorda Tympani via the Lingual N. A considerable band is easy demonstrable in the dog, pig and sheep as leaving the Lingual N. shortly before it dives into the tongue and running back along the Mandibular (Wharton's) duct to enter the gland.

In the ox there are two such bands, one above and one below the duct. In spite of repeated attempts, neither I nor any of my students (whose eyes are keener) have been able to establish such a nerve in the horse. Arloing-Lesbre mention fine filaments, but we have not found them.

Dog.—Mr. J. M. McDonald, Class B, observes :—The thyro-hyoid M. is innervated by the hypoglossal N.

Ox.—Mr. P. Leckie observes :—There is no visible ganglion nodosum (plexiform G) on the vagus N.

Sheep.—Mr. H. G. Stewart, Class B, observes :—There is an anastomotic loop between the hypoglossal N. and the ventral branch of the second cervical N.

AN INTRAVENOUS INJECTION APPARATUS.

By COLONEL E. K. WALKER, C.I.E., O.B.E., F.R.C.V.S.,
Principal Punjab Veterinary College, India.

The apparatus illustrated below has been devised to facilitate the intravenous injections of large quantities of fluids, and is particularly useful in the larger animals. The container, which can be firmly held

in one hand by an assistant, consists of a graduated calcium chloride glass jar with rubber attachments as shown.

The needle is inserted into the vein, and when it is seen by the upward flow of blood that it is free in the lumen of the vessel, the fluid is allowed to arrive at the nozzle of the rubber tube, which is then inserted in the needle. Pressure is exerted by the hand bellows fixed to the glass tube in the top of the jar.

If bellows are not available, there is no objection, in the case of antiseptics, to the human mouth being substituted. The quantity of fluid injected is restricted to that contained in the portion of the jar above the reservoir, that in the latter being allowed to remain to safeguard the danger to be apprehended from the unwitting injection of air or breath. It is suggested that, ordinarily, two jars should be used, one containing normal saline solution, and the other the fluid to be injected. Normal saline is first injected to ascertain that the needle is properly inserted in the lumen of the vessel and then, without moving the needle, the fluid from the second jar is injected. Finally, more saline is injected to wash out the needle before withdrawing it. When irritant fluids are to be injected this procedure appears to be essential.

Clinical Articles

PURPURA HÆMORRHAGICA IN HORSES.

By JAMES McCUNN, M.R.C.S., L.R.C.P., M.R.C.V.S.,
East Ham, London, E.

Some time ago I published a series of cases, in the Veterinary Journal, of purpura hæmorrhagica in horses, in which the intravenous administration of formaldehyde had proved successful in promoting recovery. Since then, however, I have suffered from a dearth of subjects.

Of late years, purpura, like many other equine diseases, has, in my experience, been on the decline, probably due to more hygienic conditions, better or more rational feeding, and above all the introduction of the eight-hour day.

I have had three more cases of the disease, all of which recovered.

No. 1 was a six-year-old black cart mare which had been treated by the horsekeeper for " cold " for about a week. It was found one morning with purpuric swellings affecting the head, throat and all four legs. There were well-marked petechæ, showing in the visible mucous membranes of nose and eyes. There was some respiratory distress, anorexia, difficulty in movement, and temperature 103·5°. An intravenous injection of ʒiss formaldehyde in ℥x of boiled water

was given, and the rest of the treatment nil. The second day there was marked improvement, particularly in the swellings in the head region, with consequent relief of respiratory symptoms. On the third day ℥iss formaldehyde was again administered as before, and recovery was complete in four days.

No. 2 was an aged bay gelding in good condition, which had been ill for some days, suffering from "catarrh." In this case there was only a little swelling of the head, the legs and abdomen being the regions most involved. There were well-marked petechiæ, with a temperature of 104° F. ℥iss formaldehyde was administered as in case No. 1, and from time of injection there was a gradual improvement, recovery as regards purpura being complete in a week. In this case no other medicinal treatment was given.

No. 3 was a seven-year-old dark bay cart mare in fair condition. It had been off its food and had been kept in for a day or two. There were petechiæ, and the swellings were confined to one fore leg, the abdomen and sides of the chest. This horse was not in any distress or seriously ill, so it was decided to give formaldehyde in draughts to see if it had any effect. ℥i in a pint of water was given three times daily, plus usual mild febrifuge treatment. The case progressed straight away and there was no need to give an intravenous injection.

Case No. 3 might make one think that formaldehyde by mouth might be as efficacious as intravenously, but for my own part I would only use that method in mild cases. I have recently, in consultation with a neighbouring colleague, treated one of the worst cases of purpura one could see, and in this case we gave formaldehyde in draughts as well as intravenously with satisfactory results.

One of my difficulties with this intravenous treatment has been to get practitioners to give it a trial. They fear complications and seem to be afraid of doing anything unorthodox.

Personally, I now look upon it as a specific and do not hesitate to use it in any case. If practitioners would give it a trial, and report results favourable or otherwise, the treatment would be on its trial, and so rule out such things as luck, coincidence, etc., which arise from one man's experience.

I will be pleased to help, if possible, and answer any inquiries from practitioners *re* this method of treatment.

AN OSSEOUS MOLE IN A MARE.

By TOM HARE, M.B., Ch.B., B.V.Sc., M.R.C.V.S.,
The Thompson-Yates Laboratories, University of Liverpool.

The very interesting observations made by Dr. Crew* upon an equine lithopedion has prompted the author to submit his notes

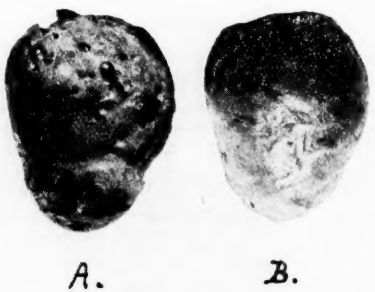
* Crew, F. A. E.—"An Equine Lithopedion"—Veterinary Journal, 1926, lxxxii, 261.

made ten months ago upon a case for which he is indebted to Mr. W. Tweed, M.R.C.V.S., D.V.S.M.

The specimen "was found attached to the cleansing of a mare which had given birth to a healthy foal." In reply to further enquiries Mr. Tweed added that this foal resulted from the first and only coitus of the mare's life, that both gestation and parturition were uneventful, and that the mare was "in splendid condition."

Macroscopically, the specimen was an unilobular egg-shaped fluid-containing cyst, 8·0 by 6·5 cms. cross diameters, weighing 120 grams before, and 55 grams after aspiration of its fluid contents. With the exception of some irregular islets of tense semi-transparent parchment-like tissue, the wall, which was of an average thickness of 2·0 mms., was composed of a very vascular and spongy osteoid material. The smooth shining luminal surface was raised here and there into small conical papillæ of a fleshy consistency (see Figure). Enveloping, and adhering to the outer hummocky surface of the cyst wall was a very thin tough membrane which at the centre of the obtuse extremity was continuous with a vascular cord, 7·5 cms. in length, and of the thickness of a bootlace. The specimen suggested an Easter egg suspended by a string.

The cyst contained 57 ccs. of a deep orange-coloured, odourless, faintly turbid, watery fluid, which with a specific gravity of 1012, proved faintly alkaline to litmus. Albumin was present, but neither reducing substances nor crystals were found. The centrifuged sample contained a very slight deposit of normal blood corpuscles, but no epithelial cells, hairs, or parasites. *Post-mortem* changes accounted



Photograph of the Osseous Mole from (A) its Luminal Surface, showing the Conical Papillæ, and (B) its Outer Surface from which the Fibrous Cord has been removed.

for the variegated bacterial flora of the cyst fluid and possibly for the turbidity.

In sections stained with hæmatoxylin and eosin lamellæ of fibrous tissue lying parallel with the surface are seen to constitute the outer and inner surfaces of the wall. Dividing these fibrous lamellæ as it were into two bounding sheaths is a centrally placed zone of reticular tissue of varying width containing many blood vessels whose walls are thin and whose lumena are in many cases occupied by normal blood corpuscles. In sections of the thicker and more brittle areas of the wall this central zone contains osseous trabeculæ. The cells of the innermost fibrous layer constitute the lining of the luminal surface. There is no evidence of any recent inflammatory reaction within the wall.

Discussion.—The histological findings point to a degenerative process occurring within an embryonic sac, with its chorion and amnion represented by an outer and inner fibrous zone respectively. The pedunculated nature of the cyst may be interpreted as being due to its location within the anterior extremity of the non-pregnant horn. Discussing cystic moles in cattle, Williams† states that " the embryonic sac retains its usual form, but is without evident placental structure, and apparently maintains its growth and existence by absorption of liquids from the uterine cavity." In this case, however, the cyst was undoubtedly fed with fresh blood at the time of parturition, also it received its blood supply via the vascular cord which presumably was in direct continuity with the blood vessels of the membranes of the normal fœtus.

There is a very striking similarity between Dr. Crew's and the author's cases. Both specimens were passed following the birth of normal foals, the one " enfolded in, but unattached to, the placenta," the other " attached to the cleansing." In shape, size, and structure the cysts bear a marked resemblance. They differ in that the one contained an adherent calcareous hollow body, while the other contained 57 ccs. of fluid only. Williams states that " frequently the embryo dies and all traces of it disappear while its sac persists and apparently continues to grow." Thus in animals as in the human it would appear that the presence of recognisable remains of the embryo is inconstant, a phenomenon which may be attributed to a variation in the age of the embryonic development, *i.e.*, the smaller the embryo the more complete its absorption, or to the adequacy of the cyst's blood supply, *i.e.*, the more profuse the blood supply the more complete the absorption of the embryo.

† Williams, W. L.—" The Diseases of the Genital Organs of Domestic Animals "—" Ithaca," N.Y., 1921.

In the discussion upon his case Crewe submits as his opinion " that this was a fœtus corresponding to a previous pregnancy that had been extruded from the presently non-pregnant uterine horn." In the present case only one coitus had taken place in the mare's life, and following upon that sexual contact a normal foal, together with the cyst described had developed. Thus it would appear that two ova became fertilised, and gestation commenced with twins, one in each horn ; but an early death overcame the one embryo, while the other developed to maturity.

The remarks of Whitridge Williams‡ show an interesting comparison between the sensitiveness of the human and animal uteri to the irritation of a foreign body. " In many early abortions the expelled ovum is a thin-walled cystic structure filled with clear fluid and containing a minute degenerated embryo, or only a remnant of the umbilical cord. This condition represents an early stage of hydramnios, and corresponds to the dropsical or blighted ovum of the early writers."

These cases raise the interesting question as to the cause of death of one of twin embryos within a normal uterus of a healthy female.

Addendum.

At a meeting of the V.M.A. of Ireland, May 27th, 1910, Col. Chas. Steel showed a specimen, of which the description is recorded (*Vet. Record*, 1910-11, xxiii, 43) : " A globular hollow body, about four inches in diameter, which was ejected with placental membranes of a mare ; the thin material constituting this sac was distinctly osseous. Suggested that it consisted of a uterine cyst, and that it might be the result of a twin impregnation arrested at a certain period."

Professor J. F. Craig made the following observations upon the specimen : " The probable explanation of the abnormality from the uterus was that it was really a monstrosity or a perverted development from an ovum. The wall of the structure appeared to be formed of true bone of a spongy nature. It was not at all probable that it was an echinococcus cyst, because the latter would hardly preserve its contour when it became calcified, and would not present the characters of bone."

‡ Whitridge Williams, J.—" Obstetrics "—N.Y. and London, May, 1922, 261.

POST-PARTUM DYSPEPSIA OF BOVINES.

By W. RUTHERFORD WALLACE, M.R.C.V.S.,
Aberdeen.

SYNONYMS.—Retention of the lochia; deferred milk fever.

DEFINITION.—A disease of milch cows occurring from ten days to six weeks after parturition, characterised in the acute and subacute forms by dyspepsia and a lethargic state of the alimentary and urogenital tracts, combined with nervous phenomena, and in the chronic form by dyspepsia, lethargia and cachexia.

VARIETIES.—Three varieties of this disease are commonly seen, viz., acute, subacute and chronic, each variety appearing distinct, although intermediate forms are met. There is little tendency for the acute form to become subacute, or for the subacute form to become chronic.

SEASONAL INCIDENCE.—The majority of cases are met in early spring while the animals are still housed, odd cases occurring throughout the winter. The disease is less seldom encountered while the animals are at pasture.

ETIOLOGY.—The exact etiological factor of this disease—as of many of the bovine affections, characterised by nervous phenomena—is rather obscure, although prolonged artificial feeding in the absence of Nature's green food would appear to be a contributory cause, and might be cited as the direct cause of the initial uncomplicated dyspepsia. The acute and subacute forms appear to have some etiological relation to milk fever, since mammary insufflation or the intravenous injection of glucose solution usually effects a cure. The chronic type appears to be referable to functional disorder of the hepatic apparatus, and in those chronic cases which do not recover there is usually found on necropsy organic disease of the liver in the form of cirrhosis or fatty degeneration.

COURSE.—From the initial appearance of symptoms in the form of slight dullness, constipation and diminished appetite, the acute form usually runs a course of twenty-four to thirty-six hours, and in the absence of suitable treatment is almost invariably fatal. The subacute form runs a course of two to three days, with progressive dullness and inappetance followed by nervous phenomena, a fatal issue being the rule when no treatment is applied.

The chronic type may last a fortnight to six weeks, accompanied by constipation, inappetance, pica and cachexia, with a tendency to recovery if turned out to pasture.

SYMPTOMS.

ACUTE FORM.—In this type the first observable symptoms are dullness and relative alimentary stasis, followed in the course of

twenty-four hours by incoordination of muscular movements, the animal showing symptoms not incompatible with those of drunkenness in the human subject.

Maniacal symptoms rapidly follow and the animal usually endeavours to "climb the walls," or it may assume the recumbent position and exhibit the classical symptoms of milk fever, death finally following in convulsions or in a state of coma.

SUBACUTE FORM.—The symptoms in this type develop more gradually and are primarily those associated with ordinary indigestion, dullness and constipation being particularly in evidence. The fæces are rather similar in appearance and consistency to those of the ovine species, and a heavy fœtid smell is given off from the breath and milk, the latter having a mawkish taste. Grinding of the teeth with a marked tendency to lick the manger, or persistently lick a leg or foot is an outstanding feature of the subacute type, and once this stage is reached there is a rapid intensification of the symptoms especially of the nervous phenomena. Complete incoordination of muscular movements follows, and the animal, now decubitus, passes either into convulsions or into a state of coma, followed by death.

CHRONIC TYPE.—The chronic type is characterised by distinct symptoms of subacute dyspepsia, with a craving for the less digestible constituents of the ration. Chronic constipation is an outstanding feature, the fæces being hard and leathery in consistence, and blackish in appearance. The characteristic smell from the breath and milk is present, and the animal shows a tendency to lick the walls or manger. Grinding of the teeth with irregular rumination is evident, followed by complete loss of appetite. Cachexia gradually supervenes and the animal in from three to six weeks passes into a state of complete marasmus, death finally ending the scene without a struggle.

DIAGNOSIS.

IN THE ACUTE CASE diagnosis is based on the time elapsed since calving, the hyperæsthesia, and the classical symptoms of milk fever. Passage of a catheter into the uterus reveals the presence of a brownish fluid—hence the synonym "Retention of the Lochia."

IN THE SUBACUTE CASE the outstanding feature is the indigestion with constipation, accompanied by incoordination of muscular movements, with a tendency to persistently lick any object within reach.

THE CHRONIC TYPE has as the outstanding symptom the heavy sickly smell from the breath and milk, accompanied by obstinate constipation and gastric derangement.

In both the subacute and chronic types there is in the uterus a quantity of odourless chocolate-coloured fluid.

Differential Diagnosis.

Milk Fever.—Time elapsed since parturition, with generally more hyperæsthesia, and a less tendency to complete anæsthesia.

Stomach Staggers.—Time elapsed since parturition, together with the tendency to aimlessly lick the walls, leg or foot.

Cerebro-Spinal Tuberculosis.—History and condition of animal. Gradual onset in tuberculous infection.

Lead Poisoning.—History, and absence of characteristic teeth grinding associated with lead poisoning. No blindness in post-partum dyspepsia.

Hepatic Cirrhosis.—The chronic form is difficult to differentiate apart from the heavy sickly smell from the breath and milk.

Prognosis.

Acute.—Excellent—90 per cent. recoveries with suitable treatment. Where there is a tendency to relapses the prognosis is less favourable.

Subacute.—Good—90 per cent. recoveries with treatment. Relapses are often unfavourable.

Chronic.—Fairly good—70 per cent. recoveries if pasture available.

Treatment.

Acute.—Mammary insufflation, with chloral hydrate per rectum, followed by purge, together with gastro-intestinal stimulants in the form of ammonia, carbonate and nux vomica, in salted gruel. Turn out to grass if available.

Subacute.—In mild cases chloral hydrate with purge, followed by ammonium carbonate and nux vomica. In more severe cases mammary insufflation with chloral hydrate per rectum, or glucose intravenously followed by purge and gastro-intestinal stimulants. Turn out to grass if available.

Chronic.—Judicious use of purgatives combined with gastro-intestinal stimulants. Formalin has been advocated, but its benefits are very doubtful. Grass will often effect a cure when all other means fail.

In the acute and subacute forms relapses occasionally occur, when the original treatment is again applied. Relapses may occur every two days, in which case there is little hope of a successful eventual recovery, although temporary recovery may be brought about by the intravenous injection of ten ounces of 10 per cent. aqueous glucose solution.

Pathogenesis.—In the acute and subacute forms little is found apart from alimentary stasis and retention of the lochia. In the

subacute type there may be found post-mortem, organic disease of the liver.

SEQUILÆ.—Inhalation pneumonia from careless drenching when nervous phenomena are present.

PROPHYLAXIS.

Prophylactic measures are difficult to formulate, as our climatic conditions—at least in Scotland—do not admit of the pasturing of animals in winter or early spring.

The immediate purging of all recently calved animals showing signs of dullness or inappetance would appear to be the only practical prophylactic measure available. In spring, turning animals out to grass on the first sign of illness will often work more wonders than all the drugs in the pharmacopœia.

PARIAH DOGS.

BY A. C. AGGARWALA, B.Sc. HONS. (PUNJAB), M.R.C.V.S.,
Professor, Punjab Veterinary College, Lahore.

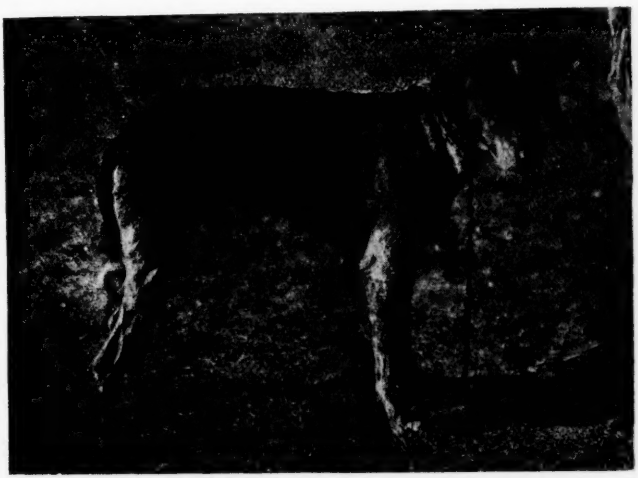
PARIAH dogs constitute an indigenous and a nondescript breed of dogs in the East, particularly seen in the towns and villages of India, where they act as general scavengers.

The term " Pariah " is probably derived from the Tamil name given to the lowest class of the Hindu population of Southern India, who are also called " outcastes," and do not belong to any of the four recognised castes of the Brahminical System. These people pass their lives in the huts outside the village limits and work more or less as slaves. The same term is now generally appropriated for indigenous Indian dogs of mongrel breed of not much value.

Regarding the real progenitors of the existing pariahs there is no definite proof, but in all probability, and as many naturalists have more than once stated, they are not far removed from the native jackals. Some are also of opinion that the pariahs may have descended from the wolves, but if that had been the case, the denial of domestic care to them and their present habit of roaming about after their own free will, would have long since made them resume some of the ancestral wolf-like characters. Unquestionably, there has been sufficient time allowed to them for the purpose. Some observers have applied the term pariah to the wild dogs of India which are found where wolves are abundant, but none of these wild dogs have so far assumed the characters of the wolves, nor have they mixed with them. With jackals, on the other hand, they have marked points of resemblance. It is not rare to find some small-sized pariahs

very much like the jackals wandering in the towns. The present-day pariah dogs, however, have lost the attractive tufted tails and delicate skins of their ancestors, but in other respects they exhibit a close affinity.

All colours and their mixtures are met with, but a rusty-reddish-brown fading to a lighter colour on the belly is the commonest. The hair is usually rather coarse in texture. The tail is moderately long and in some cases tufted. The ears are large, drooping and hairy. The pupils are rounded. A characteristic is a long narrow face with a comparatively less broad forehead. The eyes are rather small and sunken, and not so bright as in other domestic breeds of dogs. The forelegs are long, thin and straight, with a narrow but deeply set



chest, tucked up belly and well-padded toes—qualities which render them good runners. The senses are very acute, especially those of smell and hearing. Fully grown up dogs stand about 1 ft. 10 in. in height, and are about 2 ft. in length from the point of the shoulder to the buttocks, but all sizes are met with.

Regarding their food, they eat practically anything with equal avidity from fresh meat to rotting carrion and carcases of mammals, etc. They wander from house to house in search of food. At some places food may be given to them, but they usually live by stealing. On occasions most of them will eat fæces, reptiles, crabs, insects and different kinds of vegetable matter.

They generally associate in bands, each of which has its own allotted territory, in which no other dog dares intrude. If, perchance, one happens to trespass the bounds, he is sure to be attacked by the dogs of that area. Their habit of barking at strangers is most annoying, and to these they are frequently dangerous.

Pariah dogs have not so far been domesticated and made pets of in the sense applicable to various breeds of dogs in other countries. Some, if reared and brought up properly from their puppyhood, would wag their tails on being called, crouch at the feet of their masters, and behave in almost all respects like domestic dogs. It is natural, however, that they should not give up some of their dirty habits, acquired since many generations, easily, unless great care and circumspection is bestowed upon them. Nevertheless, they are fairly intelligent and submissive provided they are treated and fed properly. They make good watch dogs. Pariah dogs of the hill tracts are more beautiful, stronger and more intelligent than their brethren in the plains. They act as leaders and guardians to herds of cattle and sheep, and protect them against the attacks of wild animals.

The enormous number of stray and ownerless pariahs constitutes an important factor and a standing menace in so far as the dissemination of disease in India is concerned. They spread disease not only amongst themselves, but also among other animals and man. A large number of them suffer from dangerous skin affections, mange being the commonest. Others harbour specific internal parasites, but the most noteworthy disease spread by these dogs is rabies. The mortality of cases of rabies both in man and animals from bites of rabid pariah dogs is greatly alarming. In addition to this, pariahs are a positive nuisance, and the cause of great economic loss to the people. In fact, the dog proposition in India is serious and demands urgent consideration at the hands of the veterinary and medical professions. The only sound policy in this connection is probably their wholesale destruction. Theoretically, the problem may also be solved by increased domestication, but that is not possible in India where people are illiterate and ignorant. State legislation is indicated where general ignorance prevails. The chief drawback, however, is the antipathy shown among many classes of Indian people to the killing of animals. This must be overcome before any hope of dealing with the problem of the wholesale destruction of ownerless dogs can be entertained.

INVAGINATION OF INTESTINE FOLLOWED BY STRICTURE.

By HERBERT BUCKINGHAM, M.R.C.V.S.,
Norwich.

April 10th, 1926.—Aberdeen terrier dog, four years old. Owner said he brought him to my surgery two weeks ago, but I was out, so he took him "somewhere else." The dog was sent back to owner as cured. Dog was straining badly, periodically he yelled for three minutes at a time, very loudly. Passing small quantities of bloody, fœtid fluid from rectum.

I could feel an impaction in the intestine like a sausage, but smaller in diameter. This I could not break up, or make an impression upon by manipulation. His appetite was and always has been good.

April 11th, 1926.—I put him under chloroform and explored his rectum with my second finger. I felt a constriction in the bowel, and passing my finger through it, I came up against a mass of material containing pieces of bone. I then withdrew my finger and the bowel followed it, and then, plainly into vision came the invaginated part of the bowel and the impacted ingesta. I pressed it back into the rectum and passed a long pair of cat's parturition forceps (they are half an inch across each blade or loop, and capable of being passed seven inches into rectum).

I was easily able to pass them through the restricted lumen of the bowel, and after "fishing" several times, I removed *all* the obstructed material.

Then by using the forceps I manipulated the bowel in such a manner as to completely reduce the invagination.

I gave him plenty of liquid paraffin and a mild aperient.

He suffered from slight hæmorrhage from rectum, and his fæces were very fœtid and offensive.

Fed him only on milk at first, then soft foods.

April 17th, 1926.—I sent him home, *not* as cured, but thinking that as I could do no more for him I would give him a chance.

His fæces are now normal.

I told owner to feed him on soft food and no bones. Owner said it would be difficult to keep him from bones. I said, "Shut him up for a time."

May 4th, 1926.—Dog returned to me with an order to kill him as he yelled at night, had diarrhœa, and smelt so badly.

I did so and made a *post-mortem* examination, and found no invagination, no inflammation, but a stricture anterior to the latter, an impacted bowel of a length of seven inches.

NOTE ON A CASE OF CONGENITAL BILATERAL STENOSIS OF THE EPIDIDYMIS IN THE GOAT.

By DR. A. W. GREENWOOD,
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THE reproductive organs of an Anglo-Nubian Swiss goat were sent to the Animal Breeding Research Department for examination by Mr Gold, M.R.C.V.S., to whom the thanks of the writer are due for the opportunity of reporting this specimen.

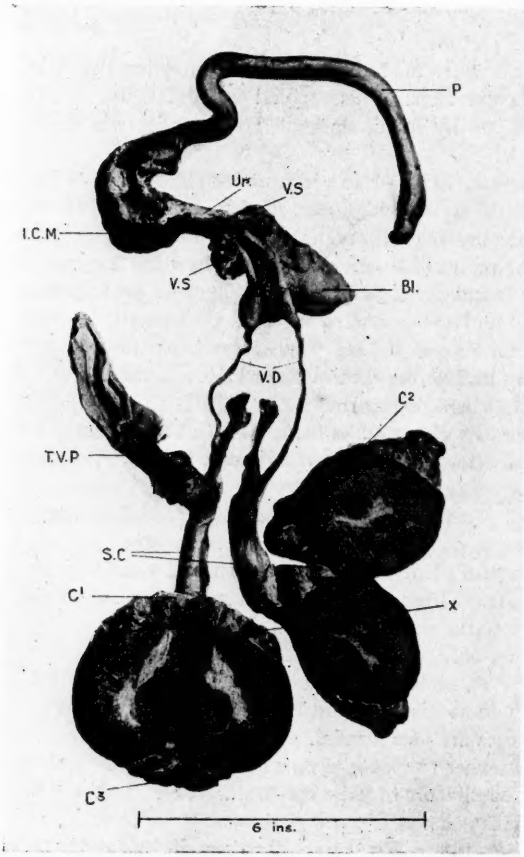

FIG. 1.—Photograph of the Genital Organs and Associated Ducts. Bl, Bladder; C1, Caput epididymis; C2, Corpus epididymis; C3, Cauda epididymis; I.C.M., Ischio-cavernosus muscle; P., Penis; S.C., Spermatic cord; T.V.P., Tunica vaginalis propria (dissected off); Ur., Ureter; V.D., Vas deferens; V.S., Vesicula seminalis; X., Cavity in which a large mass of inspissated sperm had been retained.

Mr. Gold states that the animal was apparently a perfect male in all respects, and was used for stud purposes on 12 occasions without, however, any result. The goat was born twin to a hermaphrodite. At the age of 12 months it was killed and the genital organs dissected out.

The genital glands and associated accessory ducts were apparently normal from an external macroscopical examination. When, however, the testes and epididymis on both sides were bisected mediolongitudinally, it was seen that the caput of the epididymis and the structure of parts of the gonadic tissue were distinctly atypical. The tubules of the caput region of the epididymis on both sides were filled and in some parts relatively enormously distended by a thick yellow cheesy concretion, smear preparations of which showed it to be composed of inspissated mature spermatozoa. The corpus and cauda epididymis on both sides showed no abnormal structure, and smear preparations revealed complete absence of spermatozoa in these regions.

The structure of the testes was for the most part normal, but here and there at the cut surface of the glands small opaque areas were present. Motile sperm were obtained from the testes.

From a histological examination of the testes it was found that the bulk of the reproductive tissue consisted of tubules filled with cells in all stages of spermatogenic activity up to the formation of

FIG. 2.—Section of Degenerating Area of the Testis. × 50. A, Spermatic tubule filled with mature sperm; B, Completely degenerated tubule in which the germinal epithelium has disappeared; C, Earlier stage in tubule degeneration; D, Aggregation of lymphocytes in the intertubular spaces.

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mature spermatozoa. These tubules did not differ in any way from those found in the testis of the normal functioning male.

Examination of the opaque areas in the testes, mentioned above, showed that they consisted of tubules filled with masses of mature spermatozoa. The original epithelium lining the basement membrane of the tubules had disappeared. Lymphocytes were numerous in the intertubular spaces in these areas (Fig. 2). Surrounding the opaque tubules there was a more or less extensive area of highly degenerate tissue consisting of shrunken tubules, the germinal epithelium of which had in most cases partially, and in a few others completely, disappeared. The presence of cell debris in the lumen of the tubules marks the final stage in the degeneration of the desquamated germinal epithelium.

Histologically the structure of the epididymal tubules of the corpus and the cauda regions were normal, but in the caput region the accumulation of the sperm in large masses resulted in the lysis of the epithelial tubular lining.

The case described above is one of complete pathological stenosis of the epididymis resulting in the retention and accumulation of the mature sperm first in the proximal region of the epididymis and efferent ducts, then later gradually packing up the testicular tubules. The accumulation of sperm in the tubules of the testis is preceded by definite degenerative changes following a cessation of the spermatogenic activity. This degeneration is probably due to increased intratubular pressure and the production of toxic substances by the breaking down of the masses of accumulated sperm.

This case is of interest in that it supplies additional evidence as to the effect of epididymectomy on the subsequent fate of the reproductive tissue. The operation has been performed by many experimenters, but the conclusions drawn from these experiments have been diverse, some authors maintaining that degeneration of the reproductive cells follows the operation, while others hold that it is followed by no such degenerative changes.

Recently Tamura and Crew have repeated this work and come to the conclusion that experimental epididymectomy is followed by gradual degeneration of the reproductive cells, and the author suggests that the facts stated in this note are in agreement with their conclusion.

The bilateral symmetry of the abnormal condition described would lend credence to the view that we are dealing here with a structural developmental abnormality and not with a pathological condition resulting from a parallel infection of the epididymis on both sides of the body.